

What is claimed is:

- 5 *gib*
1. A method of processing a substrate, the method comprising:  
providing a substrate in a process chamber;  
introducing a gas into the process chamber;  
energizing the gas by passing RF energy through a wall of the  
process chamber; and  
detecting radiation propagating through the wall.
  2. A method according to claim 1 comprising energizing the gas by  
powering an antenna external to the process chamber.
  3. A method according to claim 2 wherein the antenna (1) covers a  
portion of a ceiling of the process chamber, (2) is substantially non-vertical, or (3)  
comprises a planar coil.
  4. A method according to claim 2 wherein the antenna covers a  
portion of a ceiling of the process chamber, and wherein the ceiling (1) is at least  
partially dome shaped, (2) comprises a ceramic, or (3) comprises a portion that is  
substantially permeable to RF energy.
  5. A method according to claim 1 wherein the radiation propagating  
through the wall comprises optical energy.
  6. A method according to claim 1 wherein the wall comprises a  
window that (1) faces the substrate, (2) is substantially permeable to electromagnetic  
energy, (3) is substantially permeable to optical energy, (4) comprises one or more of  
silica, sapphire or quartz, (5) is removable from the wall, or (6) is permanently affixed  
about an opening in the wall.
  7. A method according to claim 1 comprising monitoring radiation  
propagating through the wall with a process monitoring assembly, and wherein the  
process monitoring assembly (1) is housed in an enclosure above the wall, (2) is

adapted to be mounted above a window in the wall, (3) is mounted to allow line-of-sight view of the substrate in the process chamber, (4) is responsive to optical radiation, or (5) comprises an interferometer.

5                    8.     A method according to claim 1 comprising monitoring radiation propagating through the wall with a process monitoring assembly comprising a signal source, a signal detector, a collimating assembly and a radiation transmission cable connecting the collimating assembly to the signal source and signal detector, the radiation transmission cable having a bifurcated end.

9.     A method according to claim 8 comprising connecting a first branch of the bifurcated end to the signal source and a second branch of the bifurcated end to the signal detector.

10.    A method of processing a substrate, the method comprising:  
         placing a substrate in a process chamber;  
         introducing a gas into the process chamber;  
         powering an antenna covering a portion of an external surface of  
         a ceiling of the process chamber to couple energy to the gas; and  
20                    detecting radiation propagating through a window in the process chamber.

11.    A method according to claim 10 comprising monitoring radiation propagating through a window in the ceiling of the process chamber.

25                    12.    A method according to claim 10 wherein the antenna (1) is substantially non-vertical, or (2) comprises a planar coil.

30                    13.    A method according to claim 10 wherein the ceiling (1) is at least partially dome shaped, (2) comprises a ceramic, or (3) comprises a portion that is substantially permeable to RF energy.

14. A method according to claim 10 comprising monitoring radiation comprising optical energy propagating through the window.

15. A method according to claim 10 wherein the window (1) faces the substrate, (2) is substantially permeable to electromagnetic energy, (3) is substantially permeable to optical energy, (4) comprises one or more of silica, sapphire or quartz, (5) is removable from the wall, or (6) is permanently affixed about an opening in the wall.

16. A method according to claim 10 comprising detecting radiation with a process monitoring assembly, wherein the process monitoring assembly (1) is housed in an enclosure above the ceiling, (2) is adapted to be mounted above the window, (3) is mounted to allow line-of-sight view of the substrate in the process chamber, (4) is responsive to optical radiation, or (5) comprises an interferometer.

17. A method of processing a substrate, the method comprising: providing a chamber having a top surface that is at least partially dome shaped; and monitoring radiation that propagates through the top surface during processing of the substrate.

18. A method according to claim 17 comprising monitoring radiation that propagates through a window in the top surface.

19. A method according to claim 17 comprising powering an antenna covering a portion of the top surface of the chamber to couple energy to process gas in the chamber.

20. A method according to claim 17 comprising monitoring radiation comprising optical energy propagating through the window.

21. A method of processing a substrate, the method comprising: placing a substrate in a first enclosure;

introducing a process gas into the first enclosure;  
powering an antenna outside the first enclosure to energize the  
process gas; and  
monitoring processing of the substrate from a second enclosure  
disposed above the first enclosure.

22. A method according to claim 21 wherein the antenna is within the second enclosure.

23. A method according to claim 21 comprising monitoring radiation propagating from the first enclosure to the second enclosure.

24. A method according to claim 23 comprising monitoring radiation with a process monitoring assembly at least partially within the second enclosure, the process monitoring system comprising a signal source, a signal detector, a collimating assembly and a radiation transmission cable connecting the collimating assembly to the signal source and signal detector, the radiation transmission cable having a bifurcated end.

25. A method according to claim 24 comprising connecting a first branch of the bifurcated end to the signal source and a second branch of the bifurcated end to the signal detector.

26. A substrate processing apparatus comprising:  
a process chamber and  
a process monitoring assembly comprising a signal source, a signal detector, a collimating assembly and a radiation transmission cable connecting the collimating assembly to the signal source and signal detector, the radiation transmission cable having a bifurcated end.

27. An apparatus according to claim 26 wherein the radiation transmission cable is a fiber optic cable.

28. An apparatus according to claim 26 wherein the transmission cable comprises a first branch connected to the signal source and a second branch connected to the signal detector.

5 29. An apparatus according to claim 26 comprising a first enclosure to energize process gas and a second enclosure at least partially enclosing the process monitoring assembly.

10 30. A substrate processing apparatus comprising:  
a process chamber comprising a wall, wherein the wall comprises  
a ceiling portion comprising an external surface;  
an antenna at least partially covering the external surface of the  
ceiling portion; and  
15 a process monitoring assembly responsive to radiation that  
propagates through the wall during processing of the substrate.

20 31. An apparatus according to claim 30 wherein the wall comprises a window.

32. An apparatus according to claim 30 wherein the window is in the ceiling portion.